Chapter 3

Management

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Identification

It is now vital to ensure all captive flamingos are marked so that they can be individually identified. There are two main types of ring or band available. These are metal rings/bands (either models made from an alloy of nickel and copper or aluminum) or large Darvic plastic rings/bands. Metal rings/bands probably last longer but it is necessary to catch birds to identify individuals. Engraved plastic rings/bands have the advantage that they can be read easily without the need to catch birds to identify them.

Metal rings/bands should only be applied by an experienced ringer/bander using a pair of ringing/banding pliers.

Engraved plastic rings/bands are made out of two or three sheets of different colored plastic laminated together. The letters or numbers are engraved exposing the second color which contrasts against the outer layer. These can be made in various sizes and length to fit each species of flamingo.

Plastic rings/bands can either be bought ready made and engraved or, with the correct equipment rings/bands can be cut, engraved and molded on site. This is only practical if thousands of rings are to be made on site.

All rings/bands need to be fitted properly to avoid any damage to the birds' legs. Because flamingos spend a large proportion of their time standing in water, it is advisable to apply the ring/band on the upper leg above the tarsi-tibia joint.

Ring/band wear and ring/band loss appear to be greater in breeding birds compared to non-breeders (Pickering 1992). This may mean that some birds may require regular re-ringing/banding. Permanent transponder tags may soon be required for C.I.T.E.S. species and may prove valuable in the long term. The bill patterns of flamingos are highly variable and individually distinct. A photographic record of each individual in a flock should ideally be made when they are first ringed.

All flamingos are sexually dimorphic and most individuals can be sexed using one or two standard measurements (Studer-Thiersch 1986, Richter and Bourne 1990). Standard measurements are tarsus, bill length or bill and head, wing length and body weight. This can be checked by laparoscopy.

Rings/Bands

Plastic rings/bands are the recommended form of physical identification. They are easy to order and relatively inexpensive, providing numerous color variations, numbers, lettering and stripes. It is

important to note that the color of the plastic may affect the durability of the band, with different colors having different strength characteristics, i.e., white core appears to last longer (P. Shannon, personal communication). Additionally, color may be important to overall readability of the band, e.g., WWT recommendations state that yellow with black lettering or green with black lettering may be the easiest to read. Conversely, dark backgrounds with white lettering may become difficult to read if mud fills the light lettering. Simplicity of lettering or numbering is recommended, using not more than a two-digit system but with the numbers repeated two to three times around the circumference of the ring/band (vertical versus horizontal orientation). Please consult the Bibliography for detailed articles about ring/band design. Please see Product Information below if you do not have a supplier for plastic rings/bands.

It is recommended that the ring/band be placed above the tarsal joint on the leg. Size of the ring/band should be suited to the species and to size variations within the species. Please consult any of the ring/band suppliers in the Product Information section for appropriate size. Some institutions place ring/bands above the foot, but this may adversely affect readability and increase the risk of injury if the ring/band slips over the toes. The plastic ring/band has the potential to migrate on the leg causing constriction or abrasion. It is recommended to consult your TAG if you have concerns about this. Ring/band suppliers recommended in this publication have experience with the appropriate material to minimize abrasion. Occasionally rings/bands crack, break or fade over time. Therefore, it is recommended to have a secondary or back-up means of identification.

Also, after the band has been placed on the leg, the overlapping edges can be, if desired, bonded with a high-quality adhesive. After application, the surfaces can be held together with clear adhesive tape, which will wear off with time. Band wear and band loss appear to be greater in breeding birds compared to non-breeders (Pickering, 1992).

Secondary Identification

a) Plastic or metal ring/band

b) Transponders: The use of a transponder is optional. Transponder failure and migration have been reported. The bird must be in hand or adjacent to scanner to read the transponder. The IUCN/SSC Captive Breeding Specialist Group's recommendations (CBSG, 1991) concerning transponder site and use should be followed when using a transponder system. The transponder should be placed dorsally at the juncture of the neck and the body on the left side.

c) Plastic cable ties, such as are used by electricians to bind a group of cables or electric wires together, are not recommended except as a temporary form of identification. The cable tie has a mechanism intended to synch the tie around the object(s) and the only way to loosen the tie is to cut it. The ties can constrict the bird's leg causing compromised circulation, swelling or abrasion. Instances of birds' bills becoming entangled in the cable ties have been reported. In addition, birds can manipulate the ties in such a manner as to further tighten them around the leg.

d) Wing Web Clip/Patagial Flags are not recommended.

e) Tattoo/dyes are not recommended.

f) Physical characteristics that are specific to some birds (e.g., old fracture, bill and facial markings, size, eye injuries, etc.) may allow some secondary identification to be

possible, especially in a small flock. This method is not reliable and highly subjective, but it is always useful to note these special individual characteristics.

Record Keeping

It is particularly important to keep accurate records on long lived birds such as flamingos. During a flamingo's life, (50+ years) even if it stays in the same collection, it is likely to be looked after and be the responsibility of a large number of people. It is essential that each flamingo should be individually marked and records kept of any movements between collections, mates, breeding, offspring and health. It is particularly important for the future genetic management of captive flamingos that accurate records of breeding and parentage are kept.

Each season a map of the nest site should be drawn with the location of each nest marked prior to the first egg being laid. If the flock goes on to breed the flock should be checked daily to record the location of each egg, lay date and identity of the parents. Care should be taken to check each nest every day as birds are frequently displaced from their nest by incoming pairs.

The absolute minimum for a system of records should be a card index with one card for each bird. More convenient, but more expensive is a computer data base. The Animal Records Keeping System (ARKS), developed and supported by International Species Information System (ISIS), has now become the world standard. Standard For Data Entry by Joanne Earnhardt (AZA publication) offers guidelines that might be a starting point for standardized record management.

Capture, Handling and Restraint

Flamingos are captured, handled and restrained for a variety of purposes. Some of the more common reasons are for weight measurements, placement of identification, pinioning and seasonal flock movement. On occasion it may be necessary to intervene for a particular event or circumstance such as for shipments, removal of sick or injured birds, individual or flock movements, construction or severe natural events. It is not recommended to handle or move birds often, or during the breeding cycle (see Reproduction, Chapter 4). When considering flamingo colony intervention, it is prudent to weigh the benefits of the procedure against the stress and possible physical harm that may be incurred. Catching and moving flamingos can result in severe injury or death. It is recommended to seek advice from your TAG prior to undertaking a move or capture if not familiar with the process.

There are several basic guidelines that should be observed when working with flamingos. It is important to be aware of the flocks' position at all times, while in or around the exhibit. Awareness will facilitate in responding to the flamingos' behaviors or reactions to external stimuli. Avoid sudden movements and loud unexpected noises that could frighten the flock. Do not leave objects (e.g., hoses, shovels, rakes) unattended in the exhibit. These could be potential sources of injury from tripping. Training should be provided for all bird and non-bird personnel who may have reason to work with or around flamingos.

Methods used for capture and handling are influenced by exhibit design, flock size and birds' behavior. It is important to observe and interpret individual bird or flock behavior to aid in capture. Flamingos can be conditioned over time to recognize particular keeper behaviors or movements eliciting a particular response from the bird (i.e., hands in the air to prevent birds' approach, back

turned to allow birds' passage). Again, care should be taken to protect birds from potential hazards in the exhibit such as rocks, branches, pipes, slopes, holes, etc. Once captured, extra persons may be required to hold birds. Planning and discussion of capture and handling procedures should be undertaken prior to the event.

Capture

In planning a capture sequence, managers should consider the following important factors:

a) Species
b) Number of birds
c) Reason for capture
d) Location of capture - indoor vs. outdoors; water and land details (i.e., topography, depth, etc.)
e) Acclimation level of the flock
f) Previous capture experience for both flock and staff
g) How many staff available/needed for event
h) Location of release
i) Procedures planned while birds are in hand - time in hand
j) Ambient temperature (it is not a good idea to plan a catch in hot weather)

It is imperative to understand that all these factors are co-dependent. Circumstances are variable as are each of these factors. After evaluating the above factors, managers can then decide on the type of corralling necessary and the appropriate barrier materials.

Corrals

Flamingos can be herded into primary and even secondary corral systems, when it is necessary to catch them up. In smaller flocks, birds can be conditioned to enter a corral, if used routinely (e.g. winter holding), or a "follow-the-leader" type behavior may be encouraged to move the flock to a desired area. In larger flocks, selectively separating out smaller numbers from the flock into corrals may work as well. By letting a few birds out at a time they can be caught up without causing undue stress to the flock as a whole.

Corrals may be permanent or temporary and the barriers made from a variety of materials. In designing new exhibits, managers should take into consideration the necessity of catch and release for flock management (see Housing, Chapter 2 for further details.)

Barriers

Barriers can be modified to fit the corral size needed. Some commonly used barriers include fencing, plywood, burlap, regular or closed-cell foam, and black or clear plastic sheeting. Mesh barriers are not recommended due to the high risk of injury due to entanglement. Care must be taken when using fencing to ensure the holes are small enough so wings or feet do not penetrate. Fencing not greater than 1" X 1" is recommended. Some abrasions have been noted from birds rubbing against wire when closely confined. Burlap and plastic sheeting work best as hand-held

barriers. Given adequate numbers of staff, a line of people arms length apart can function as a barrier.

Barriers can be designed as a corral, as a corridor to direct the route the birds are to follow, or to block visual access to unfamiliar or frightening objects. In other cases, materials can be used to reduce the impact on objects with which birds might collide. Hand-held barriers can be used to separate small groups from the colony or move the entire colony in one direction.

Water versus Land Capture

The advantage of arranging water capture is that the birds' movements are inhibited, making them easier to catch by hand. In addition, deeper water can reduce the impact if a bird were to trip or fall. Some disadvantages include potential medical complications from birds getting wet, hypothermic or aspirating water. Other hidden dangers might include submerged rocks, wood snags, plants or pipes.

Advantages of land capture are the ability to visually read leg rings/bands for easier identification and targeting of selected birds. The propensity for birds to collide with barriers and fall has greater probability for injury.

Hand Capture

It is recommended that flamingos be caught by hand. It is not recommended to use hand-held or mist nets. Flocks may become sensitized to long-handled tools if hand-held nets are used. One way to catch a bird is to take hold of the upper part of their wing (T. Richardson, pers. comm.)

Escapes

Flamingos can and will escape from outdoor exhibits, even if flight ability has been restricted. Methods for capture are similar to in-exhibit capture with added hazard considerations such as public access, vehicular traffic and buildings.

Handling and Restraint

Techniques

Whenever possible, birds' legs should remain unfolded. Folding can increase the risk of capture myopathy and leg paralysis or injury. A very large or unruly bird may require folding the legs for ease of handling or safety. Other circumstances might dictate the need for folding. If folding of the legs is to be undertaken, it must be done with caution. To fold, grasp the legs below the ankle joint and apply gentle pressure until the bird relaxes. Legs should never be forced into a folded position. Additional care should be taken to avoid crossing the legs at the ankle.

a) Hand-held restraint:
    i. Body close to holder, head facing backward; legs may be down or folded.

ii. Body close to holder, head facing forward; legs may be down or folded.

iii. Wing hold at shoulders with one hand, grasping neck gently with the other, legs down allowing bird to be guided along in a semi-walking fashion It is recommended that only handlers with experience use this method.

b) Mechanical restraint:

i. On occasion it may be necessary to restrain a bird in a sling. Slings are made from fabric, foam and/or plastic. Flamingos can be secured in the sling by using cloth, vet wrap, tape or netting. When positioning the bird, one should take into account the bird's comfort level and the injury necessitating the use of a sling (See Health and Medicine, Chapter 6).

ii. Towels can be used as a temporary form of restraint for weighing. The flamingo is wrapped snugly with legs folded. Another towel can be draped over the head (as it lays on the back) to reduce external stimuli. Some facilities place the bird in a clean trashcan with a lid for weighing. Subtract the weight of the trashcan.

Special Considerations

a) Time in hand: Every effort should be made to reduce the overall time birds are handled from capture to release. Advance preparation can greatly reduce the amount of time birds are in-hand by insuring proper training and adequate supplies.

b) Concerns: Medical problems associated with capture and handling include overheating, myopathy, leg paralysis, and trauma-related injuries such as dislocations, fractures, tendon/ligament damage, eye injuries, broken blood feathers, lacerations and abrasions. A period of flock over-excitability and in appetence is likely to follow any capture event (Ref. Health and Medicine, Chapter 6).

c) Safety: The wearing of goggles and hooded sweatshirts to prevent bite injuries is used by some institutions as a safety precaution. Do not wear jewelry, as birds may bite off or become entangled in the articles. Some facilities have used hoods or socks to quiet the bird by covering the head.

Moving Between Exhibits

When moving birds from summer to winter holding or between exhibits flamingos may be walked, guiding with hand-held barriers, or hand-carried. All the same handling and restraint considerations apply.

Release

When releasing flamingos, managers must take into consideration all the same factors as listed for capture with special attention to the following points:

a) The time from capture to release should be as short as possible. Pre-planning is vital to this aspect of capture, handling and restraint.
b) Release is a critical stage in the capture sequence; it is advised that an experienced person undertake the releasing of birds following capture.
c) Managers must examine exhibits for release locations that have an even topography for a land release or moderately deep water (two to three feet) for a water release.
d) A variety of techniques may be used to release flamingos. Flamingos may be unsteady on their legs by the time of release, especially when folded. Furthermore, they are often panicky and eager to escape being held. If the bird has been folded, it is important to unfold the legs and ensure the legs are steady and the bird is able to stand before release. Blood flow may have been compromised and simple massage of the legs and thighs with fingers can assist with improving the blood flow. Extra caution should be used when dealing with a struggling bird, as these birds may bolt away and fall. Having a quiet area within the exhibit where birds can reside immediately following release without undue disturbance or keeper activity is beneficial.
e) Managers should make provisions for a reduction of disturbance in and around the flock. This should include keeper activities, landscaping or other activities in proximity to the exhibit.
f) Flocks should be monitored closely following release for signs of capture myopathy. Medical problems resulting from a capture event may be seen from the time of release to two weeks thereafter. Common symptoms might include leg shaking, shivering, droopy wings, generalized weakness, lethargy, in appetence, and individual isolating from the main flock.

Crating and Transport

Crating and transport are areas of flamingo management that require further examination. Previous transport experience is often vital to a successful shipment. Even experienced managers have had serious adverse consequences resulting from the shipping process. However, successful movement of flamingos is crucial to the future management of self-sustaining captive populations.

It is recommended that flamingos be shipped individually crated and free standing when possible. This method eliminates folding and may reduce the incidence of capture myopathy, leg paralysis and overheating. It is not recommended to ship freestanding birds grouped together due to reported wing and leg injuries. International Air Transportation Association (IATA) regulations require the following container dimensions; 50cm (19.5in) long, 90 cm (35.5in), tall and 35cm (14in) wide per container, or compartment of a container. Padding, made from a soft non-destructible material, is required under the top of the roof. The two cm (3/4 in) wood frame is covered with lightweight plywood or similar. The floor must be covered with a solid non-slip, leak proof absorbent material (non-agricultural) and securely attached to the floor to give bird a solid foothold. The container must have an entry and exit means, the front or rear may slide or be hinged with a secure means of fastening, or the roof can act as a lid. Adequate ventilation must be provided in at least three sides of the container. Flamingos must be packed individually in compartments of a container, or in an individual container. No more than four flamingo compartments must be in a single container. Separate food and water containers must be provided, they must be accessible for refilling, and the sides of the water container must be flanged to prevent spillage. (For additional information and specifications see IATA CONTAINER REQUIREMENT 17).

A note about slinging individual birds inside shipping compartments.:

Although IATA includes slings within the shipping specifications as optional, flamingo managers should consider the hazards associated with slinging birds unmonitored during shipping.

The height of the sling must be properly adjusted to fit each individual bird so that it is in contact with the keel, without supporting the bird. That is, each bird's feet should be allowed to touch the floor of the shipping container compartment. This means each sling must be custom fitted to each individual flamingo. Severe leg and foot injuries have frequently occurred when using slings often leading to death. Flamingos struggle while in transit and a sling makes this worse as the bird can not reason why it is unable to move unrestricted and so it continually fights trying to free itself from the sling. If slings are used they should only be installed by an experienced, proficient handler. In the past, some airlines have refused shipments without slinging birds. If you experience this tell your airline cargo manager that IATA now allows slings to be optional. The AZA Ciconiiformes Taxon Advisory Group does not recommend the use of slings during shipping.

Preparations

Key considerations in preparing for crating and transportation are:

a) Species, age and physical condition
    i. It is not recommended to transfer flamingos two years of age or younger.
    ii. Do not ship during wing molt due to increased risk of blood feathers breaking.
    iii. Caribbeans may be more high-strung than other species.
b) Time of day and year
    i. breeding cycles
    ii. air temperatures
c) Total flight/confinement time
    i. from capture to release
    ii. folded no longer than eight hours
d) Temperature
    i. above 0° C (32ºF) but below 21° C (70º F)
e) Conditions under which birds are caught and crated
f) Expense

Methods of Shipment

A variety of methods have been used to ship flamingos. Among them are the following:

a) Freestanding, individually crated. Construct a crate large enough to allow the bird to stand at normal height but narrow enough to prevent extension of the wings. Be sure the dimensions of the box are long enough to accommodate the legs of a bird if it were to sit down. The best substrate is indoor/outdoor carpet secured to the floor. One disadvantage of this method is that the crate may be difficult to maneuver within the air cargo hold during loading and unloading. In addition, the size of the crate may preclude airline shipments.
b) Standing, crate height to back (keeps bird's head down). Construct a crate of a height no higher than the back of the bird. This allows the bird to stand but unable to raise the

head above shoulder level. The bird is then in position to steady itself with its bill, if necessary, for balance. Again, the crate must be of a dimension to accommodate the legs should the bird sit down and/or flex its wings. The advantage of this method over the full freestanding method is that the crate is smaller and the bird may have better balance inside the crate.

c) Folded, wrapped, and crated. Crates are constructed individually or larger with individual compartments. Again, size will depend on the mode of transportation; airlines have size restrictions. Each bird is wrapped and secured from rolling after placement in its crate or compartment. The disadvantage of this method is that birds are folded. However, if the crate meets airline specifications, birds can be shipped over longer distances than by truck. The risk of myopathy is greater.
d) Folded, wrapped, in back of truck. Flamingos have been transported as a group in the back of a truck lined with clean hay. Each bird is individually wrapped in a pillowcase then nestled in the hay, which prevents the birds from rolling around. An alternative method to prevent rolling would be to use pipe insulation tubes, cut to length, on each side of each bird. Since the birds' heads are free, it is advised to alternate the position of each bird, i.e., head, tail, head, tail, to prevent aggression. A refrigerated truck is recommended to help regulate temperature. The disadvantage of this method is that birds are folded, and it is only recommended for shipping distances of less than eight hours.
e) Freestanding in back of truck/van. This method involves putting freestanding birds together in the back of a truck, commercial van or trailer. The vehicle should be padded and air ventilation assured. The substrate should be non-slip and securely affixed to the floor. Birds are then added one-by-one to the holding space until all birds are loaded. The disadvantages of this method include the high propensity for a bird to be injured from falling and being trampled. Driving must be slow with careful starts, stops and turns.

Shipment Procedures

Preparing the Flock for Shipment

Refer to Health and Medicine (Chapter 6) of this manual (Noninfectious Diseases – Capture or External Myopathy) for recommendations on the supplementation of Vitamin E/selenium prior to and at transport.

Crating

Flamingos have been transported in sky kennels, cardboard boxes and wooden crates. A crate can be designed to hold more than one bird and compartmentalized to eliminate direct physical contact between birds. Crate dimensions vary depending on the species to be shipped. The bird's position in the crate (standing or folded) will determine the length, width and height. It may be necessary to have several crate sizes available. There should be one bird to each compartment, although they may be built in blocks of up to five compartments. Internal walls may be made of a thick sacking material (T. Richardson, pers. comm.)

Crates can be constructed using plastic, wood, cardboard or pegboard. Metal containers are not recommended. Evaluate the interior for potential scrape hazards and cushion as necessary. Proper air ventilation and circulation is imperative, and ventilation holes are suggested on at least

three sides. A secured indoor/outdoor carpeting or a similar non-slip surface is recommended for the bottom of the container. Other substrates that have been used are shavings and clean hay.

Wrapping

A pillowcase of 100% cotton or gauze-like material is used to enclose and immobilize folded birds for transport. Nylon or body stockings are not recommended. The pillowcase is affixed with masking or duct tape to secure the legs and body. Caution must be taken to ensure the legs are not crossed inside the case. It is critical that this material allow heat exchange to prevent overheating. It has been reported that a cotton tubular fabric (similar to material used to cover casts in hospitals) has been used with some success.

Transport

Airplanes have the advantage of covering a greater distance in a shorter period of time. Advance communication with the airline is necessary to ensure the crate size will fit in the cargo hold. It is recommended that an attendant accompany the shipment to facilitate in container placement, monitoring and later release.

Release following shipment

Birds should be removed from the container as soon as possible. It may be necessary to assist the bird in standing. This may simply involve supporting the bird until it can stand, massaging the legs or walking the bird to increase circulation. Weaker birds may need to be slung for a few hours prior to release. Some birds may get too wet when released in water, exacerbating weakness. It is recommended that birds be monitored closely up to 24 hours after release. Managers should be aware that problems associated with transport may occur up to one week following release.

Shipping and Transport - Examples of What Has Worked

Modified Sling For Shipping Flamingos

Steffan Patzwahl, Parc Paradisio (Belgium)

This shipping crate design was used by Ralph Boussfield of “Birds and Game” in Botswana. Mr. Boussfield shipped 70 adult-sized Greater flamingos (Phoenicopterus ruber roseus), rehabilitated birds found as chicks in an abandoned colony, from Botswana to Belgium. The duration of the trip was more than 24 hours, and only one of the 70 birds was lost in transit.

Each crate contained four adjacent compartments. Cotton cloth walls divided the compartments. Cotton cloth wrapped around the body of each flamingo (with wings closed) was stitched closed down the middle of the flamingo’s back. Openings were made for the neck, cloaca and legs. A piece of cotton attached (sewn) along both sides of the top of the compartment was slung under the flamingo. Food containers were attached along the front wall of the crate.

Shipment of 20 Greater Flamingos from Slimbridge Wildfowl & Wetlands Centre to the Auckland Zoo

Nigel Jarrett, Avicultural Manager, The Wildfowl and Wetlands Trust (England)

Sixty-day-old Greater flamingo chicks (Phoenicopterus ruber roseus), hand-reared in isolation under strict quarantine conditions, were flown in special crates over 11,000 miles to New Zealand. They were reared and attended by Michael Batty, a senior keeper at the Auckland Zoo. They went first to quarantine and then on to a purpose-built African Exhibit at the Auckland Zoo.

Shipping Chilean and Caribbean Flamingos from Discovery Island to San Francisco

Scott Barton, Disney's Animal Kingdom (U.S.)

In the fall of 1999, Discovery Island (Orlando, Florida) shipped 32 Chilean flamingos (Phoenicopterus chilensis) and 65 Caribbean flamingos (Phoenicopterus ruber ruber) in three separate shipments. Two shipments were by ground vehicle, and one shipment of 32 Chileans flamingos was shipped by air to San Francisco (California). For these shipments, birds were in the crates from eight to 14 hours.

All flamingos were shipped in crates that allowed the birds to stand but did not have any sling device. Each crate had four compartments. The overall crate dimensions were: 56 inches long x 30 inches wide x 32 inches high. When putting the birds into the crates, we make sure that the birds are standing comfortably in the crate before securing the compartment. With this method, we had 100% success with each of our flamingo shipments. In one shipment, a single bird was sitting down on arrival and had difficulty standing after being released. With assistance and veterinary care, this individual recovered completely. The only other injuries were slight abrasions to the wings in the alula region on some birds. For future shipments I would consider adding padding to help with this. Narrowing the crate to 12 inches might also reduce the movement of the flamingo in the compartment and reduce these abrasions. Shade cloth denser than 0% should also be used. In all cases, these were minor injuries and resulted in no more serious complications.

Disney's Animal Kingdom also received 10 Greater flamingos (Phoenicopterus ruber roseus) from Pretoria, South Africa. They were shipped in a crate measuring approximately 1.1 meters tall, two meters wide and 2.5 meters long. This crate was divided into two sections, with five birds in each section. The flight from Pretoria to New York was over 16 hours. All the birds arrived well. The zoo in Pretoria reported that they have used this technique for other flamingo shipments as well.

In conversations on this subject with Dr. Mark Penning, a veterinarian and Director of Umgeni River Bird Part in Durban, South Africa, he related that they have shipped over 100 birds using the IATA designed crates with slings, and they see between four to six percent of the birds develop injuries or myopathy, often associated with the slings. He said that he has seen birds get their heads stuck in the leg holes in the slings, leading to serious injury or death.

Dimensions of Crates used by the Caldwell Zoo (Texas)

A shipment of Chilean flamingos (Phoenicopterus chilensis) was sent to the Wildlife Conservation Society, Bronx Zoo by the Caldwell Zoo in Tyler, Texas. The crates were 10 inches wide by 28 inches long by 29 inches tall.

Notes on American Flamingo Transport from Discovery Island to Audubon Park
Published in The Quill in 2000

Crate Details

Two types of crates were utilized for transporting flamingos. Thirty crates originally designed for Mississippi sandhill cranes measured 21 inches wide X 20 inches deep X 33 inches in height. Full-length slide doors were located in the front of each crate. An additional 15 crates were constructed specifically for this transfer and measured 18 inches wide X 24 inches deep X 36 inches in height. Full-length, side-hinged doors were located on the front of each crate. See Figure 1 for diagrams of crates.

All of the crates were padded in some manner. Pieces of carpet remnants were stapled on the ceiling and upper half of the sides in 39 crates. The inside of the doors of the larger crates were padded; the slide doors of the smaller crates could not be padded. Four of the larger crates were padded with two layers of burlap, which were stapled to the ceiling, sides and door. All crates were bedded down with one to two inches of shredded paper.

During the crating process, it was decided that larger, taller birds would be placed in the taller crates whenever possible.

Vehicle/Loading Details

Two trucks with 8'X16" refrigerated cargo holds were rented for the transfer. Temperature was controlled by digital thermostats, adjustable up to 80 degrees. As per discussion with Mary Healy, it was agreed that maintaining a temperature of 60 degrees would be desirable. In actuality, the thermostats cycled between 59 and 66 degrees with a 60-degree setting. Since the birds were enclosed in padded crates and under stressful conditions (i.e. generating more heat), a lower temp setting probably could have been used. There were no examples of extremely overheated birds when they were uncrated.

Crates were loaded in the cargo areas from front to back. Spacing between crates averaged approximately four inches on the sides, and between approximately two to three inches on the front and backs. All crates were distributed more or less equally between the two trucks. After loading the full complement of crates in each truck, they were tied together as a unit to prevent sliding or tipping. No tie-downs were available within the cargo area.

The trucks departed Discovery Island at 1300 EST (1200 CST) on 10 November and arrived in New Orleans at approximately 0200 CST on 11 November. Travel time including several refueling/rest stops totaled 14 hours. Birds spent between 15 and 18 hours crated during the trip.

Quarantine Facility

For the first 24 hours, birds were allowed access to only the indoor portion of the quarantine area. This consisted of three indoor holding rooms measuring 12 foot square, with two similarly sized adjoining outdoor areas (see Figure 2 for schematics). The concrete floors of the inner rooms were bedded down with straw, while several rubber mats padded the floor of the outer areas. Two wading pools were placed in the outdoor area along with feeding tubs. Inner rooms were artificially lighted.

On Friday, 12 November, the group was allowed access to the large, outdoor courtyard measuring 48 feet X 40 feet with grass substrate. A small portion of the yard was partially flooded to allow the birds to dabble in mud pools. Four wading pools were placed throughout the yard in addition to four feeding tubs. One pool has a continuously running hose to provide a source of fresh water, however, the birds preferred pools that became muddy. Once the birds had been given access to the outdoor courtyard, they would not utilize indoor holding areas.

Unloading Details

Upon their early morning arrival in New Orleans, the decision was made to uncrate the birds. Since some birds had been crated for over 15 hours, it was felt that it would not be in the birds' best interest to keep them crated until first light. Within 20 minutes of arriving, staff began unloading birds one at a time. A veterinarian was present with one additional staff member when unloading birds. As each crate was opened, birds were carefully assisted in exiting the crate and were then examined by the vet. Heads, wings and legs were examined for abrasions or other injuries. Each bird was physically supported until it was confirmed that it was coordinated and capable of walking, after which it was released. Only three to four birds were found in the sitting position as the crates were opened. Only one of these birds was one from a large crate.

Virtually all of the birds were a bit shaky after uncrating, but all but one bird was able to quickly walk away with minimal assistance. The one exception was a large bird (yellow #52 R) that had been crated in a small crate. The bird was found in a sitting position, and upon its removal from the crate was alert but very uncoordinated with poor balance and leg extension. The bird's hocks were slightly abraded due to contact with the unpadded portion of the crate's sides. After physically supporting the bird for up to five minutes, it was able to stand and, with difficulty, take short steps. Its condition continued to improve over the next 20 minutes, and the decision was made to let it remain with the group without further intervention.

Post Arrival Details

Throughout their day of arrival, the flock was very nervous and flighty. Food was offered in the morning. However, there was no evidence that the group ate (most likely stress-induced loss of appetite), but introduction of a new diet was probably also a factor. By Friday, 12 November, the group was allowed access to the outdoor courtyard. Food was offered in both dry form and with water mixed in to form a slurry. By Saturday, the group's appetite began to improve, and by Sunday, 14 November, it had recovered completely. By this time, the group was displaying normal behaviors and showed little to no sign of stress. Windows overlooking the courtyard proved to be the most effective way to observe the group at close quarters.

Weighing

It is recommended to weigh birds opportunistically, if circumstances allow, when birds are in-hand. Several techniques have been used to weigh flamingos as follows

a) Folded and restrained (towel) without a container.
b) Restrained in a container (e.g., trash can)
c) Keeper holding bird with a walk-on scale.

Other measurements, such as bill and tarsus length, can also be taken at this time. The addendum at the end of this chapter outlines the various measurements that can be taken and the methods and materials to accomplish the task

Flight Options

It is recommend that flamingos be full-winged in appropriate exhibits (ref. Housing, Chapter 2). It is currently hypothesized that full-wing flamingos have better balance for copulation than their flightless counterparts, which may improve overall fertility. However, many exhibits are not designed to house full-wing birds. The three most common ways to render a bird flightless are pinioning, feather clipping and tendonectomy.

a) Pinioning is the surgical removal of the metacarpals, which permanently inhibits flight. Some managers prefer a long pinion, where four to five primaries are left intact. It is believed that fertility may be enhanced in long-pinioned birds. It is still unclear if a long pinion adequately inhibits or prevents flight.
b) Feather clipping involves cutting the primaries along the wing coverts on one wing. This method is not recommended due to the irregularity and frequency of wing molt in flamingos. It is temporary and may need to be repeated every six to eight months.
c) A tendonectomy is a surgical procedure that abrades the carpo-metacarpal joint to ankylose or freeze the joint. This procedure is not recommended. There has been low success in preventing flight, and it is highly invasive with a long post-operative recovery period. Tendonectomies can only be done on adults; birds under two years of age are at increased surgical risk and, therefore, poor candidates for this method.

Sex Determination

It is recommended that all birds be sexed. The most commonly used sexing techniques are DNA analysis (blood, feather pulp), surgical laparoscopy, body measurements and behavioral observations.

a) DNA analysis and laparoscopy are the most reliable methods but may not be practicable. (Reference Health and Medicine, Chapter 6)
b) The tarsus, bill length or bill and head, wing length and body weight are anatomical features used for measurement (Studer-Thiersch 1986, Richter and Bourne 1990). Caribbean flamingo juveniles can have measurements taken as early as 2-2.5 months of age. Kevin Drees of Blank Park Zoo in Des Moines, Iowa reported that the tarsal lengths of 12.12 Chilean flamingos were measured. Male tarsal lengths were between 28.57 and 29.53 cm. Female tarsal lengths were between 25.01 and 26.07 cm (95%

confidence intervals). For more information on measuring flamingos, see the addendum to this chapter, Measuring Flamingos, by Nigel Jarrett.

c) Behavioral observations, such as pairing or copulations, as a sole source for gender determination are not recommended. However, behavior can be used as a temporary method for sexing until other procedures can be performed.

Pests/Predators

Predators and pests can be a problem for any flamingo exhibit. Depending on geographical location, predators may include foxes, raccoons, dogs, coyotes, bobcats, rats, humans, owls, eagles, hawks, herons, white ibis, gulls and snakes. Pest species include Canada geese, flies, mosquitoes, fire ants and lice. Managers should be aware of standing water as an environment for vector species (e.g., mosquitoes), which carry avian malaria, the West Nile Virus, and pox. New World flamingo species are especially vulnerable to West Nile Virus.

Protection from predators might include aviary housing, electrical fencing, Havaheart© traps, motion sensor lighting or barriers (above and below ground). Some managers have had to move their flocks on and off exhibit nightly. Alternating feeding stations and times might break up the routine, reducing gull/heron/white ibis numbers in the exhibit.

For mixed species exhibits see Housing, Chapter 2 for incompatible species.

Product Information

Havahart Traps- Valentine Inc. 4259 S. Western Blvd. Chicago, IL. 60609
phone: 1-800-438-7883 and fax (312) 650-9099

Sources for plastic rings/bands:

Catherine King – EAZA Ciconiiformes/Phoenicopteriformes EEP Chair

European Association of Zoos and Aquariums

Peter Shannon- (phoenicops@aol.com)

Haggie Engraving –Avian Color Bands for Marking and Research (haggie@intercom.net)

Transponder- See your professional organizations recommendations

Tubular fabric - 50% cotton and 50% polyester –

Kimberly Clark, O.R. Specialty Products, phone: 1-800-524-3577

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Addendum to Chapter 3

Measuring Flamingos

Compiled by Nigel Jarrett, The Wildfowl and Wetlands Trust (WWT)

Introduction

Morphological measurements of flamingos are used by WWT to ascertain differences in body size that can be related to differences in mating and reproductive success, and in condition and survival.

WWT has developed a guide to describe and standardize the terminology and methodology for various external linear measurements that may be taken from live flamingos under field conditions. The guide seeks to reduce the variation and the detail with which measurements are reported.

The WWT guide defines and illustrates those measurements, which have proven useful and practical for flamingos in captivity. With practice, all of the measurements can be taken from live birds quickly and humanely. The guide is largely based on that for measuring geese, developed by Duzbin and Cooch (1992).

What Measurements to Take?

The measurements that are useful for a study aimed at differentiating populations may be different from those needed to characterize the condition of the individual birds. Therefore, a researcher must decide how the morphometric data is to be used before deciding which measurements to record. In general, the researcher should aim to take a sufficient number of different measurements from each individual bird to characterize its overall structural size.

As a minimum, three hard measurements (see below) should be taken, since three dimensions are the minimum needed to define a 'geometric space'. Hard measurements are those of variables/characters, which do not change in magnitude within individuals as a function of age, length of time a bird is held, or when during the annual cycle the bird is measured. Typically, skeletal bones, such as tarsus are hard characters. In contrast, soft variables/characters can change significantly due to a variety of factors. For example, the body mass of the bird is significantly affected by the stage in the annual cycle at which it is measured: a bird weighed immediately after breeding may be significantly lighter than one caught immediately prior to spring migration.

Nevertheless, body mass is a soft character that is regularly recorded since it is easily measured and provides useful information on the condition of a bird. However, body mass alone cannot not be used as a measure of body size, as body mass will, in part, be a function of structural size. Additionally, body mass is more susceptible to short-term variations than other soft or hard characters, with, for example, variation attributable to handling time before weighing or time of last feeding.

For birds measured during their first year, all characters are soft because in flamingos there is significant growth of all characters during this time. Thus, comparisons of measurements are meaningful only if the age of the bird is known.

The WWT guide recommends that researchers attempt to measure at least the following characters:

Hard measurements
- head length
- total tarsus length
- sternum length

Soft measurements
- flat wing (a.k.a. wing chord) length
- ninth primary length
- body mass

This set of measurements can be taken from a bird in under three minutes.

This minimum set of measurements should be supplemented with as many other measurements as possible. The minimum set contains both hard and soft measurements. If time does not allow for the minimum set of measurements to be recorded, then only the hard characters should be taken. In general, the hard characters are more repeatable than the soft characters (with the exception of body mass, which is highly repeatable). This is because not only are soft characters more variable over time, but they are also more 'malleable' in hand - subtle variations in caliper pressure may cause considerable variation in the measurement. Despite the problems associated with measuring soft characters, there is considerable value in taking such measurements. Soft characters are often the most sensitive indicators of variation in the condition of a bird.

Basic equipment

Equipment needs include a set of digital or Vernier calipers, a steel rule for the linear measurements (long enough to at least measure the length of the ninth primary), and a scale (Pesola™, Salter™ or electronic) for body mass. The measurement board is useful for measurement of total length and flat wing (see the wing chord photographs for an example of an easily constructed measurement board). All equipment should be checked and calibrated against known standards prior to use in the field.

Definitions and Techniques

culmen: The chord of the upper mandible length, measured medially from the lowest point of the forehead at the midpoint of the upper bill, where the integument meets the horny portion of the mandible, to the distal tip of the bill.

bill-nares 1: Diagonal length of the upper bill measured from the anterior edge of the nostrils to the distal tip of the upper mandible.

bill-nares 2: Diagonal length of the upper bill measured from the posterior edge of the nostrils to the distal tip of the upper mandible.

bill depth: Diagonal depth of the mandibles from the lowest point of the forehead at the midpoint of the upper bill, where the integument meets the horny portion of the upper mandible, to the lower edge of the bottom mandible.

gape: The length of the upper mandible from the posterior end of the gape to the distal tip of the nail along the mouth line.

total tarsus: The diagonal distance from the posterior junction of the tibiotarsus and tarsometatarsus to the distal junction of the tarsometatarsus at the base of the middle toe.

tarsus bone: The diagonal length of the tarsometatarsus bone only, along the outside edge.

mid-toe: The length of the middle phalanx along its dorsal surface from the proximal articular surface at the juncture of the tarsometatarsus to the distal end of the toe at the base of the claw.

nail: Also known as claw. The length of the chord of the claw from its base to its tip. Fig. 11.

wing chord: The maximum measurement from the bend of the closed wing to the end of the longest primary, with the wing flattened and the longest primary straightened against a vertical border attached to the edge of the measuring surface. Fig. 12.

ninth primary: The total length of the outermost primary feather from the insertion of the remige calamus at the skin surface to the distal end of the feather (with the ruler placed between the 8th and 9th primaries). Fig. 13.

sternum: The length of the sternal ridge nearest the skin, including the skin and feather from the distal to proximal end of the sternum. Fig. 14.

tail length: The maximum length of the entire tail fan from the point of insertion of the calamus on the skin of the center rectrix to the tip of the longest rectrix (usually the third or fourth inward from the most lateral rectrix). Fig. 15.

head length: The length of the skull from the external occipital ridge (at the back of the head) to the distal tip of the bill nail (including skin and feathers). Fig. 16.

total length: The length of the bird from the tip of the bill to the distal end of the longest tail feather - usually the 3rd or 4th from the most lateral feather. This is measured with bird laid on its back on a flat surface. Fig. 17.

body mass: Mass in grams of the entire bird measured with spring balance or electronic scales. Figs. 18 and 19.

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